

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

Claims 1-107 (Canceled)

108. (Previously entered) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises at least three amino acids from the donor immunoglobulin heavy chain framework outside the Kabat CDRs that replace the corresponding amino acids in the acceptor immunoglobulin heavy chain framework, at positions in the immunoglobulins wherein:

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- (I) the amino acid is immediately adjacent to one of the CDRs, or
 - (II) the amino acid is capable of interacting with the CDRs, or
 - (III) the donor amino acid is typical at its position for human immunoglobulin sequences, and the replaced amino acid is rare at its position for human immunoglobulin sequences.

109. (Previously entered) A humanized immunoglobulin according to claim 108, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

110. (Previously entered) A humanized immunoglobulin having a complementarity determining region from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises at least three amino acids from the donor immunoglobulin heavy chain framework outside the Kabat CDRs that replace the corresponding amino acids in the acceptor immunoglobulin heavy chain framework, at positions in the immunoglobulins where:

- (I) the amino acid is immediately adjacent to one of the CDRs, or

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

(II) the amino acid is capable of interacting with the CDRs.

111. (Previously entered) A humanized immunoglobulin according to claim 110, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

112. (Previously entered) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen with an affinity constant within about four-fold that of the donor immunoglobulin, wherein said humanized immunoglobulin comprises at least three amino acids from the donor immunoglobulin heavy chain framework outside the Kabat CDRs that replace the corresponding amino acids in the acceptor immunoglobulin heavy chain framework, and each of these said donor amino acids:
is capable of interacting with the CDRs.

Ch 113. (Previously entered) A humanized immunoglobulin according to any one of claims 108 through 112, wherein said humanized immunoglobulin is an antibody tetramer, Fab, or (Fab')₂.

114. (Previously entered) A humanized immunoglobulin according to any one of claims 108 through 112, which is substantially pure.

115. (Previously entered) A pharmaceutical composition comprising a humanized immunoglobulin according to claim 114 in a pharmaceutically acceptable carrier.

116. (Previously entered) A humanized immunoglobulin comprising a complementarity determining region from a donor immunoglobulin and an acceptor immunoglobulin variable region framework, which humanized immunoglobulin specifically

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

binds to an antigen, wherein the acceptor immunoglobulin variable region framework is a consensus framework from many human antibodies.

117. (Previously entered) A humanized immunoglobulin according to claim 116, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

118. (Previously entered) A humanized immunoglobulin according to claim 116, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

CH 119. (Previously entered) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, wherein the acceptor immunoglobulin heavy chain variable region framework is a consensus of human immunoglobulin heavy chain variable region frameworks, and wherein said humanized immunoglobulin comprises amino acids from the donor immunoglobulin framework outside the CDRs that replace the corresponding amino acids in the acceptor immunoglobulin framework, at positions in the immunoglobulins where the amino acid is capable of interacting with the CDRs.

120. (Previously entered) A humanized immunoglobulin according to claim 119, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

121. (Previously entered) A humanized immunoglobulin according to claim 119, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment


PATENT

122. (Previously entered) A humanized immunoglobulin according to any one of claims 116 through 121, wherein said humanized immunoglobulin is an antibody tetramer, Fab, or (Fab')₂.

123. (Previously entered) A humanized immunoglobulin according to any one of claims 116 through 121, which is substantially pure.

124. (Previously entered) A pharmaceutical composition comprising a humanized immunoglobulin according to claim 123 in a pharmaceutically acceptable carrier.

125. (Previously entered) A method of producing a humanized immunoglobulin that specifically binds to an antigen, comprising the steps of:

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- (1) selecting an acceptor heavy chain variable region framework whose sequence is a consensus sequence of human heavy chain variable region framework sequences;
 - (2) synthesizing a DNA segment encoding a humanized heavy chain variable region, comprising complementarity determining regions (CDRs) from a donor immunoglobulin heavy chain variable region and the selected acceptor heavy chain variable region framework;
 - (3) introducing a DNA segment encoding the humanized immunoglobulin heavy chain variable region and a DNA segment encoding a humanized immunoglobulin light chain variable region into a cell; and
 - (4) expressing the DNA segments in the cell to produce the humanized immunoglobulin.

126. (Previously entered) The method of claim 125, further comprising the step of substituting an amino acid in the acceptor heavy chain variable region framework outside the CDRs with the corresponding amino acid from the donor heavy chain variable region, wherein the amino acid is capable of interacting with the CDRs.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

127. (Previously entered) The method of claim 125, further comprising the step of purifying the humanized immunoglobulin.

128. (Previously entered) The method of claims 125 or 126, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

129. (Previously entered) A method of producing a humanized immunoglobulin that specifically binds to an antigen, the method comprising:

providing a cell containing DNA segments encoding humanized light and heavy chain variable regions; and expressing the DNA segments in the cell to produce the humanized immunoglobulin;

wherein the cell containing the DNA segments was produced by:

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- (1) selecting an acceptor heavy chain variable region framework whose sequence is a consensus sequence of human heavy chain variable region framework sequences;
 - (2) synthesizing a DNA segment encoding a humanized heavy chain variable region, comprising a complementarity determining region (CDR) from a donor immunoglobulin heavy chain variable region and the selected acceptor heavy chain variable region framework and further comprising amino acids from the donor immunoglobulin heavy chain framework outside the CDRs that replace the corresponding amino acids in the acceptor immunoglobulin heavy chain framework, at positions in the immunoglobulins where the amino acids are capable of interacting with the CDRs;
 - (3) introducing a DNA segment encoding the humanized immunoglobulin heavy chain variable region and a DNA segment encoding a humanized immunoglobulin light chain variable region into a cell.

130. (Previously entered) The method of claim 129, further comprising the step of purifying the humanized immunoglobulin.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

131. (Previously entered) The method of claims 129 or 130, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

132. (Previously entered) The method of claims 129 or 130, wherein said humanized immunoglobulin is an antibody tetramer, Fab, or (Fab')₂.

133. (New) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises an amino acid from the donor immunoglobulin framework outside the CDRs that replaces the corresponding amino acid in the acceptor immunoglobulin framework, at a position where the donor amino acid:

(I) is adjacent to a CDR in the donor immunoglobulin sequence, or

(II) is capable of interacting with the CDRs, or

(III) is typical at its position for human immunoglobulin sequences, and the replaced amino acid is rare at its position for human immunoglobulin sequences;

wherein said position is selected from the group consisting of L9, L10, L13, L36, L41, L42, L48, L49, L63, L70, L71, L79, L87, L106, H37, H48, H49, H66, H67, H68, H72, H79, H81, H82b, H86, H87, H89, H91, H94, H103, H104, H105 and H107, utilizing the Kabat numbering system.

134. (New) A humanized immunoglobulin according to claim 133, having three CDRs from the heavy chain of the donor immunoglobulin and three CDRs from the light chain of the donor immunoglobulin.

135. (New) A humanized immunoglobulin according to claim 133, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

136. (New) A humanized immunoglobulin according to claim 133, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

137. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L9 has been replaced.

138. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L10 has been replaced.

139. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L13 has been replaced.

140. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L36 has been replaced.

141. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L41 has been replaced.

142. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L42 has been replaced.

143. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L48 has been replaced.

144. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L49 has been replaced.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

145. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L63 has been replaced.

146. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L70 has been replaced.

147. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L71 has been replaced.

148. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L79 has been replaced.

149. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L87 has been replaced.

150. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position L106 has been replaced.

151. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H37 has been replaced.

152. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H48 has been replaced.

153. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H49 has been replaced.

154. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H66 has been replaced.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

155. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H67 has been replaced.

156. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H68 has been replaced.

157. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H72 has been replaced.

158. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H79 has been replaced.

159. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H81 has been replaced.

160. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H82b has been replaced.

161. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H86 has been replaced.

162. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H87 has been replaced.

163. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H89 has been replaced.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

164. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H91 has been replaced.

165. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H94 has been replaced.

166. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H103 has been replaced.

167. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H104 has been replaced.

168. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H105 has been replaced.

169. (New) A humanized immunoglobulin according to claim 133, wherein the amino acid at position H107 has been replaced.

170. (New) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises an amino acid from the donor immunoglobulin framework outside the CDRs that replaces the corresponding amino acid in the acceptor immunoglobulin framework, at a position where the donor amino acid;

is adjacent to a CDR in the donor immunoglobulin sequence;

wherein said position is selected from the group consisting of H49, H66, H94, and H103, utilizing the Kabat numbering system.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

171. (New) A humanized immunoglobulin according to claim 170 having three CDRs from the heavy chain of the donor immunoglobulin and three CDRs from the light chain of the donor immunoglobulin..

172. (New) A humanized immunoglobulin according to claim 170, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least $10^8 M^{-1}$.

173. (New) A humanized immunoglobulin according to claim 170, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

174. (New) A humanized immunoglobulin according to claim 170, wherein the amino acid at position H49 has been replaced.

Ch 175. (New) A humanized immunoglobulin according to claim 170, wherein the amino acid at position H66 has been replaced.

176. (New) A humanized immunoglobulin according to claim 170, wherein the amino acid at position H94 has been replaced.

177. (New) A humanized immunoglobulin according to claim 170, wherein the amino acid at position H103 has been replaced.

178. (New) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises an amino acid from the donor immunoglobulin light chain framework outside the

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

CDRs that replaces the corresponding amino acid in the acceptor immunoglobulin light chain framework, at a position where the donor amino acid:
is capable of interacting with the CDRs.

179. (New) A humanized immunoglobulin according to claim 178 wherein said position is selected from the group consisting of L36, L48, L49, L70, L71 and L87, utilizing the Kabat numbering system.

180. (New) A humanized immunoglobulin according to claim 178 or 179 having three CDRs from the heavy chain of the donor immunoglobulin and three CDRs from the light chain of the donor immunoglobulin..

181. (New) A humanized immunoglobulin according to claim 178 or 179, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

CH 182. (New) A humanized immunoglobulin according to claim 178 or 179, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

183. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L36 has been replaced.

184. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L48 has been replaced.

185. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L49 has been replaced.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

186. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L70 has been replaced.

187. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L71 has been replaced.

188. (New) A humanized immunoglobulin according to claim 178, wherein the amino acid at position L87 has been replaced.

189. (New) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, which humanized immunoglobulin specifically binds to an antigen, wherein said humanized immunoglobulin comprises an amino acid from the donor immunoglobulin heavy chain framework outside the CDRs that replaces the corresponding amino acid in the acceptor immunoglobulin heavy chain framework, at a position where the donor amino acid:

is capable of interacting with the CDRs;

wherein said position is selected from the group consisting of H37, H48, H67, H71 and H72, utilizing the Kabat numbering system.

190. (New) A humanized immunoglobulin according to claim 189 having three CDRs from the heavy chain of the donor immunoglobulin and three CDRs from the light chain of the donor immunoglobulin.

191. (New) A humanized immunoglobulin according to claim 189, wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

192. (New) A humanized immunoglobulin according to claim 189, wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

193. (New) A humanized immunoglobulin according to claim 189, wherein the amino acid at position H37 has been replaced.

194. (New) A humanized immunoglobulin according to claim 189, wherein the amino acid at position H48 has been replaced.

195. (New) A humanized immunoglobulin according to claim 189, wherein the amino acid at position H67 has been replaced.

CL 196. (New) A humanized immunoglobulin according to claim 189, wherein the amino acid at position H71 has been replaced.

197. (New) A humanized immunoglobulin according to claim 189, wherein the amino acid at position H72 has been replaced.

198. (New) A humanized immunoglobulin having complementarity determining regions (CDRs) from a donor immunoglobulin and heavy and light chain variable region frameworks from acceptor immunoglobulin heavy and light chains, wherein the acceptor immunoglobulin heavy chain variable region framework is a consensus sequence of human immunoglobulin heavy chain variable region frameworks, and wherein said humanized immunoglobulin comprises an amino acid from the donor immunoglobulin framework outside the CDR that replaces the corresponding amino acid in the acceptor immunoglobulin framework, at a position in the immunoglobulins where the donor amino acid:

- (I) is adjacent to a CDR in the donor immunoglobulin sequence, or
- (II) is capable of interacting with the CDRs.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

199. (New) A humanized immunoglobulin according to claim 198, wherein said position is selected from the group of L36, L48, L49, L70, L71, L87, H37, H48, H49, H66, H67, H71, H72, H94, and H103, utilizing the Kabat numbering system.

200. (New) A humanized immunoglobulin according to claim 198 or 199 having three CDRs from the heavy chain of the donor immunoglobulin and three CDRs from the light chain of the donor immunoglobulin..

201. (New) A humanized immunoglobulin according to claim 198 or 199 wherein said humanized immunoglobulin binds to the antigen with an affinity constant of at least 10^8 M^{-1} .

202. (New) A humanized immunoglobulin according to claim 198 or 199 wherein said humanized immunoglobulin binds to the antigen with an affinity constant within about four-fold that of the donor immunoglobulin.

203. (New) A humanized immunoglobulin according to claim 198, wherein the amino acid at position H37 has been replaced.

204. (New) A humanized immunoglobulin according to claim 198, wherein the amino acid at position H49 has been replaced.

205. (New) A humanized immunoglobulin according to claim 198, wherein the amino acid at position H67 has been replaced.

206. (New) A humanized immunoglobulin according to claim 198, wherein the amino acid at position H71 has been replaced.

Appl. No. 09/718,998
Amdt. dated July 24, 2003
Preliminary Amendment

PATENT

207. (New) A humanized immunoglobulin according to claim 198, wherein the amino acid at position H94 has been replaced.

208. (New) A humanized immunoglobulin according to any one of claims 133, 170, 178, 179, 189, 198 and 199 which is substantially pure.

CH 209. (New) A pharmaceutical composition comprising a humanized immunoglobulin according to claim 208 in a pharmaceutically acceptable carrier.